

Clinical Section

Protamine Zinc Insulin and its Use in Diabetes Mellitus

by

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Ever since insulin was first generally used there have been cases which were very difficult to balance even under ideal conditions of diet. It was felt that if one had an insulin that acted longer and more evenly, these cases could more easily be controlled without the necessity of giving several small injections of insulin throughout the twenty-four hour period. These difficult cases would often go from insulin shock to acidosis in quick succession if one attempted to balance them with any degree of accuracy. One method of overcoming this apparent rapid action of the administered insulin was to mix each dose with a few minims of adrenalin 1:1000, but even this expedient was not satisfactory because of the side effect of the vaso-pressor.

The first attempt to produce a longer acting insulin was made by Hagedorn of Copenhagen who combined insulin with a simple protein called protamine derived from the sperm of a species of salmon. This product known as protamine insulin was an insoluble product used in a fluid suspension. It possessed the requirements of a slow acting insulin, but it was relatively unstable in point of time. It was soon replaced by protamine zinc insulin (PZI) which is protamine insulin, to which a minute quantity of zinc is added and thus rendered relatively stable. Zinc is a normal constituent of the pancreas and its addition to the protamine compound decreased the rate of decomposition so that the product could be commercially distributed without fear of rapid deterioration.

The PZI now used is a milky fluid, being a suspension of a protamine compound of insulin. As first anticipated, its action is slow and constant, lasting usually from 24 to 30 hours. It is thus possible to administer one dose of insulin per day instead of the usual three, and in addition it is the only means of balancing those difficult diabetics who are "sensitive" to insulin and present the problem which prompted the search for long acting insulin. Because of its continued action, day and night, when PZI is used it is necessary to give six smaller meals a day instead of the usual three meals—being sure always to give a meal before bedtime. Where this is omitted, an insulin reaction is sure to develop during sleep and the patient may be found unconscious by morning. Because of this even action day and night and as one cannot eat during sleep, it is obvious that patients requiring larger doses of insulin (say 35 or more)

cannot be put on PZI alone because of hypoglycaemic reactions during the early morning hours. In such cases a combination of unmodified (old) insulin is given with PZI—the old insulin covering the morning meal and the PZI covering the balance of the diet. Old insulin starts to work in 15 to 30 minutes after administration, whereas the PZI does not start to act appreciably until 2 to 4 hours after its injection. Then it is usual to give a combined dose of say 30 units of PZI and 20 units of old insulin to a patient who previously required 3 doses of 20 units each of old insulin. The advantage in this procedure is that the patient is through with insulin administration at one sitting in the morning, and further, because of its even action, it is possible to maintain a more level blood sugar curve than was possible with old insulin.

Regarding potency, the units of PZI and old insulin are comparable in absolute action, but from a practical point of view PZI is more potent because it is slowly absorbed (being insoluble) and acts continuously and evenly. Old insulin when given in fairly large doses is capable of being excreted in the urine, whereas PZI has a far lesser tendency to elimination by the kidneys because of its gradual liberation from the subcutaneous tissues and its larger molecular structure. From actual experience PZI is considered about 10 to 15% stronger than old insulin. This is exemplified in the comparison made above in the interchanging of 60 units of old insulin by 20 units of unmodified insulin and 30 units of PZI.

The actual administration of PZI and old insulin are best given by two separate injections, but almost the same result can be obtained if the two are taken in a single syringe. The only precaution to be taken is to load the old insulin first and then the PZI. If the process is reversed and some PZI is introduced into the bottle of old insulin, the latter will be altered to modified PZI.

There is one disadvantage to PZI which from its very structure one can readily predict, i.e., reactions to its protein content. These are more frequent than is usually observed both in local and general reactions. The skin areas where PZI is injected are usually red and sometimes present urticarial wheals. After use for some time the patient may become desensitized and tolerate it fairly well. To obviate these reactions, some workers have produced an insoluble non-protein compound of insulin by the use of an organic amine—namely, Hexamine (Urotropin). This Hexamine-insulin is being tried out now and it may prove to be the answer to the problem of protein sensitivity in insulin administration. Along the same lines is the change now made in the issue of old insulin from ordinary to crystalline insulin, i.e., a preparation more pure and containing a minimum of foreign protein.

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In balancing a diabetic it is still better to start with a basal diet and to cover the urinary sugar by three injections of old insulin—one before each meal. If the total old insulin requirements is 35 units or less, the PZI equivalent (10-15%) is computed and given each morning. It will take about 3 days for the system to balance itself because the PZI action lasts longer than 24 hours and no adjustment in PZI should be made for the first 3 days. Where more than 35 units of old insulin are required to balance the patient, it will be more expedient to give a combination dose, giving enough old insulin to cover the breakfast and the balance of PZI to cover the rest of the diet, always being sure to give 5 or 6 meals through the day.

PZI has another valuable use in the treatment of diabetic coma and operative conditions in diabetics. Its use in this sphere may be aptly compared to the use of basal anaesthetics like nembutal or morphine in general anaesthesia. If a patient in coma is to be treated, one can give him 40 or 50 units of PZI as a basal insulin and then proceed to treat him along conventional lines with glucose and old insulin every hour or two. The PZI helps to combat the acidosis in a gradual progressive unnoticed manner, helping along the quickly acting potent old insulin. This manner of use of PZI is possible because in coma treatment we aim at keeping the patient loaded with sugar as a safety valve for hyperinsulinism, until the ketones are destroyed. Pre-operatively in diabetics we usually give from 15 to 20 units of PZI because, during the operation or immediately after it, an intravenous glucose solution is usually given. This acts to smoothen the course of ketone control until the patient can take food again and resume his pre-operative balanced regime.

NICOTINIC ACID B.D.H.

The recent differentiation of "Vitamin B2" into three factors (lactoflavine, "pellagra - preventing" factor and B6, the rat-dermatitis factor), followed by the investigation on the administration of nicotinic acid to pellagrins (Journ. Amer. Chem. Soc., 1937, 59), established the specificity of nicotinic acid in pellagra. Confirmation of this discovery is afforded by more recent reports (Journ. Amer. Med. Assoc., December 18th, 1937, p. 2054 and Lancet, January 29th, 1938, p. 252) and it has been shown that nicotinic acid is a precursor of the "pellagra-preventing" factor which is elaborated after the ingestion of this substance.

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The Dr. David A. Stewart Memorial Lecture

By

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The first Dr. David Stewart Memorial Lecture was delivered by Dr. E. W. Montgomery, Emeritus Professor of Medicine, former Minister of Health and Public Welfare of Manitoba, and a member of the Sanatorium Board of Manitoba, in Theatre A, Medical College, on February 28. Members of the Sanatorium Board, the Faculty and third and fourth year medical students were present. Dr. J. D. Adamson, Professor of Medicine, introduced the speaker, and Dean A. T. Mathers moved the vote of thanks.

The Three Horsemen which led the men of death since history has been written were the Black Death, the Plague and Tuberculosis. The Black Death, which was really smallpox, was conquered mainly by Jenner's marvellous discovery of vaccination 140 years ago. Plague was driven into Eastern Asia before the advancing ranks of sanitary science and by the skill of the apostles of preventative medicine. The White Plague (Tuberculosis), however, continued to hold its bad pre-eminence as captain of the Men of Death up to a time which is well within the memory of the average middle-aged citizen of today. I can well remember as a boy, hearing of whole families being wiped out of existence by consumption. Once

the fatal seed was sown in a household one by one the children were carried out, and no kind of treatment then known was of the slightest use in preventing the inevitable tragedy. I can recall one particular instance of a family of six children, everyone of whom perished under the age of twenty-five and within a period of five years. The neighbors all said in explanation, "Oh, the disease is hereditary," and the doctor agreed with them, in spite of the fact that both the father and mother of the afflicted family lived for more than twenty years after the last child had died. Where did heredity come in if it was not carried through the parents?

I was much interested in reading lately a small pamphlet published in 1870 by Niemeyer, a German pathologist, who sought to explain the growth of tubercule and its cause, but by what seems to us the most fantastic methods. In order to get tuberculosis, you either had to have (a) an attack of pneumonia, or else (b) you had to have hemorrhage from a bronchial tube. You were more liable to these accidents if you were exposed to cold, damp, or dusty air. There were many other conditions which contributed to the liability but these enumerated were of the greatest importance. By that time, 1870, the hereditary factor had been pretty well disposed of by the fact that parents of tubercular patients were frequently found to be entirely free from the infection. There were many other theories of the origin of the disease, none of which were entirely satisfactory, except to the propounder of such theories. But the solution of the puzzle had by that time been achieved by Pasteur, who, in the early sixties delivered himself of the statement that "gases, fluids, electricity, magnetism, ozone, things known or things unknown, there is nothing in the air that will cause fermentation or putrefaction, except the living germs which it contains."

Pasteur, as you know, was only a chemist whose discoveries and conclusions were scorned by the leading medical men in his own country and in Germany, but he had an attentive listener in the person of Joseph Lister, especially since Pasteur further stated in 1863 that all his ambition was to arrive at a knowledge of the causes of putrid and contagious diseases. From 1865 Lister was more than ever certain that the application of Pasteur's dictum would lead to the control of infection and inflammation in surgical diseases. He pointed out to his classes that anyone who could explain why a compound fracture almost invariably underwent inflammation and suppuration, while a simple fracture with an unbroken skin just as invariably healed without inflammation and without fever, and without delay. Even in 1861 he said, "I arrived at the conclusion several years ago that the essential cause of the formation of pus in wounds is the decomposition brought

about by the influence of the atmosphere, and Pasteur has shown that the infectious property of the atmosphere depends entirely upon the minute organisms which are suspended in it." The history of Lister's magnificent victory over the causes of inflammation is well known, and by the middle of the seventies the principles of aseptic and antiseptic surgery were generally accepted. From then on pathologists sought for a demonstration of the germ, the microscopic organism which caused tuberculosis.

Koch in 1882 became immortalized through his discovery of how to stain the tubercule bacillus, and thus definitely established the fact that tuberculosis in all forms was due to a bacterium and to nothing else. It took almost ten years for this discovery to become the common property of the medical profession, and in fact the medical text which I read, and which was published just the year before I graduated, 1892, stated that, "it is now believed Koch's tubercule bacillus is the cause of tuberculosis." In 1900 Koch made one of those colossal blunders which must forever remain unexplained. He stated that he could, and had, prepared a tuberculin which would not only cure tuberculosis, but would prevent it. It soon became evident that Koch's tuberculin would neither cure nor prevent tuberculosis; and while the cause of the disease was definitely fixed, the treatment and cure of it seemed as far off as ever. In the present year of 1940 after five decades of experiment and intensive study in all parts of the civilized world no royal road to recovery faces the tubercular patient. What is being done for victims of the White Plague in America has been accomplished largely through the genius and patience of Edward Livingston Trudeau.

Trudeau was born in New York City in 1848. His ancestry on both sides records the names of many doctors of medicine. His father, Dr. James Trudeau, returned to New Orleans, where the family belonged, shortly after Edward Trudeau was born, while his mother took him at the age of three to live in France. He returned to America at the close of the Civil War, at the age of seventeen. That very year his older brother, who had a position in New York City, became ill in September and died of Tuberculosis in December, 1865. His most distressing illness and early death made a profound impression on the sympathetic nature of Edward Trudeau, but more tragic still was the fact that during the last illness of his brother, Edward occupied the same room with him and sometimes the same bed, waited upon him and held him in his arms when he died; and, acquired tuberculosis himself! He says, "It nearly broke my heart and I have never ceased to feel the loss of my brother." In after years it developed in him an unquenchable sympathy for all tubercular patients.

After trying several ways of adding to a small legacy left him by his grandfather he finally, in 1868, became a student in the College of Physicians

and Surgeons of New York. His education in medicine was very superficial, the lectures were didactic and descriptive, no laboratory or microscopic studies were required. His preceptor in medicine, Dr. Clark, taught that tuberculosis was a non-contagious, generally incurable, and an inherited disease.

Trudeau says that in 1871 he got a position as house physician in the Stranger's Hospital, New York City, and at that time he had still to graduate. He took the position in January, while his final exams. were slated for March. He added as a startling comment on the then method of training students "I found myself at once in charge of all the wards and yet it is quite true that I have never had the slightest practical training in seeing and treating illnesses and injuries at the bedside. An incident that he mentions in his autobiography requires more than a passing note. During his medical course—eighteen months—and when in the Stranger's Hospital he developed a cold-abscess which required several slight operations before it healed, and neither he, himself, nor the surgeon who attended him was aware of the significance of this occurrence.

The two years which Dr. Trudeau spent after the close of his internship were perhaps the most eventful in his life. He married in 1871 and spent his honeymoon in visiting the capitals of Europe. On returning to America he set up practice in New York City, but during his stay in England on his European trip he had some swelling of the lymphatic glands of his neck, but he did not comprehend the meaning of this infection. He also had occasional attacks of fever, and as nearly everyone had malaria he was told that he also had malaria. One afternoon he took his temperature and was surprised to find it 101. Then a doctor advised him to go to Dr. Janeway and have his lungs examined. He laughed at the idea but the thought worried him so much that he did visit Dr. Janeway the next day. Dr. Janeway's verdict was, "the upper two-thirds of the left lung is involved in an active tubercular process. The verdict carried with it in Dr. Trudeau's mind a sentence of a speedy death. He said "it meant death and I had never thought of death before. All my rose-coloured dreams of achievement vanished into thin air. This was the month of February and Dr. Janeway advised me to go south at once to live out-of-doors and to ride horseback. I was no better, indeed worse, when I returned to New York in April." Dr. Trudeau had been very fond of hunting and fishing all his life and was an excellent wing shot. He had visited the Adirondacks on several occasions and during his illness at this time his thoughts turned to the joy he had experienced in his trips to the mountains and he finally decided to go to Paul Smith's Tavern in the Adirondacks. He says "I was influenced in my choice of the Adirondacks only by my love for the great forest and the wild life and not at all because I thought the climate would be beneficial in any way. If I had only a show

time to live I yearned for surroundings that appealed to me. I longed for rest and the peace of a great wilderness."

He stayed at a small hotel in the deep woods. The visitors were hunters and fishermen and the place remained open only during the summer season. After a long and tiresome journey by stage he slept well, and woke full of hope and interest in his new surroundings. He hired a guide, and in the morning the guide came to his room to tell him that he had fixed his boat comfortably with evergreen boughs and blankets. So he lay down in the boat and floated with the current of the river and almost forgot the misery and sickness of the last two months. He tells us that at this time he had no idea of the essential value of rest, but as he often spent the whole day in the boat fishing, or being rowed about, he was unconsciously kept at rest. The food at Paul Smith's Tavern was excellent, fresh trout from the lakes and rivers, venison from the forest, fresh eggs and fresh vegetables from the surrounding farms, abundance of fresh milk and berries and other wild fruit during the summer gave him everything in the way of nourishment that could be wished for.

He had now achieved about everything that has been achieved up-to-date for the cure of tuberculosis. His home was in a forest of pine woods, in picturesque surroundings; he was at rest in bed, or in his canoe on the lake or river twenty hours out of the twenty-four. His diet was abundant and nourishing, and towards the end of September he found he had gained fifteen pounds in weight and was apparently in his usual health. He went back to the city, but the fever returned, and his doctors decided to send him to St. Paul for the winter, because sufferers from consumption did well there on account of the large proportion of sunny days. He was allowed to drive and walk and to go hunting on foot, but he had a fever most of the time, so that by spring he was nearly as sick as he had been the year before, and he then decided to return to the Adirondacks. On the approach of winter again, he made up his mind that he would stay there in spite of the fact that Paul Smith's Tavern was sixty miles from a doctor or railroad, and was entirely cut off from all connection with the outside world.

There is no need to pursue the history of Dr. Trudeau's sojourn in the wilderness further than to say in his own words what life there had taught him. "The essence of the cure for tuberculosis was first, rest; second, food; third, fresh air and the daily regulation by a physician of the patient's life and habits." It took a long time for the importance of these factors in the cure to become crystallized as the way of living, which was absolutely imperative, and he already had spent eight years in the mountains before the idea of building a sanatorium came into his mind. Thus sanatorium treatment as we know it today in America, was instituted and grew up under the fostering

care of Dr. Trudeau. I believe at the time our sanatorium was opened in 1910 there was something like three hundred sanatoriums already in existence in North America.

The sanatorium as it exists today has a triple purpose—to cure the disease, to prevent the spread of infection by isolating the individual who carries the infection, and finally, by educating the patient in the technique of the cure so that when he returns to his home he will be able to continue the necessary treatment and care of himself, his family, and friends.

Ninette Sanatorium does many more things for its patients besides feeding them well, keeping them at rest, surrounding them with pure air and a pleasant environment. But, after all, these are the essentials; and for the inspiration behind such a way of prolonging life and curing a disease which for centuries was considered to be incurable, we must give the credit to the great and good Dr. Trudeau.

Life is a garment; when it is dirty we must brush it, when it is ragged we must mend it, but we keep it as long as we can. The imperative "must" urges us on though the end be a failure. Life's garment in these days carries with it the dust of savagery manifested in the battlefields and on the seven seas of the world. It carries with it the dust of ignorance and superstition, the dust of selfishness and injustice among men. It is then our duty, nay more, our obligation, to cleanse our lives, both personal and national, of these unclean things. We must patch up the ragged bodies of humanity and if a cure, so called, turns out to be only a patch on a worn out garment, still we are obliged to toil on, until, as Benjamin Franklin said so well, "Like the cover of an old book, its contents torn out and stripped of its lettering and gilding, the body lies here, food for worms, but the work he has done shall not be lost, for it will appear once more in a new and more elegant edition, revised and corrected by the author."

Dr. David A. Stewart was born near London, Ontario, of Scottish parentage. His father was a farmer and a saw-mill owner, a very methodical but successful business man, and I often heard Dr. Stewart tell of his father sawing up in his mill black walnut logs and magnificent oak out of which timbers the ordinary farm buildings of that part of Ontario were constructed. In 1881 the family moved into southern Manitoba and settled near Morden.

Frank B. Stewart, the father, was an intensely religious man; his wife, David's mother, was a Farquharson, her brother, James, was a professor in the Theological Department of old Manitoba College. It was quite natural, therefore, for David to look forward to a life which he would spend in the services of the Presbyterian Church. He graduated from Manitoba College in Arts in 1889, subsequently spending two years in Theology in the same institution.

In the summer of 1901 he was in the town of Frank in the Crow's Nest Pass in the province of Alberta, when suddenly, early one morning, the whole top of Turtle Mountain slipped off and rolled with fury and destruction across the town, killing some six hundred of its inhabitants. That turned Stewart's attention to the possibilities of a life spent in caring for the welfare of the human body, rather than human souls. He therefore entered Manitoba Medical College in 1902, graduating in May, 1906. The last year before graduating was spent as an interne in the Winnipeg General Hospital, and in 1907 he continued his services in the General Hospital as the first senior interne in the Medical Department of that institution.

In 1905 the late Gordon Bell, Provincial Bacteriologist, was about the first man in the province to become active in a campaign to cope with the plague of Tuberculosis which caused more deaths in Canada than all the other infectious diseases. It is a source of great satisfaction to me that I was associated with Dr. Bell in the establishment of the Manitoba Sanatorium at Ninette. We certainly started from scratch. The first and greatest difficulty to be surmounted was to get the people of Manitoba conscious of the need of an institution for the treatment of Tuberculosis. Prior to that date Tubercular patients who were able to afford to go elsewhere were sent out of the province, many of them to institutions in the south-western or western states; some to Ontario to the well-known sanatorium at Gravenhurst, and some to Saranac Lake in the Adirondacks, and many were sent to a milder climate with the vain hope that an outdoor life would effect a cure. I remember very well that the outstanding problem for the first Sanatorium Board was the financial one. We were assured of a rather generous subscription from the Provincial Government if we could obtain from the municipalities of the province and from private sources in each case an equal amount. It was found that the average citizen who could afford to subscribe was a little backward in coming forward. Therefore the Board appointed as collector a medical gentleman who was out of a job and who was said to be of a tactful and forceful disposition, and who was said to have been entirely successful in collecting his own bills when he was in private practice. On the strength of this reputation we hired him at a salary of \$1,500 a year and found at the end of a year he had collected just \$1,400, and his services were dispensed with.

I can still remember the morning when Gordon Bell phoned me to come up to the laboratory at ten o'clock to interview Dr. Stewart in regard to his appointment as Superintendent at Ninette. He had shown such ability in his clinical work at the hospital, and that, added to his experience in the pulpit and meeting public men, and above all, his earnestness and his capacity, made him an ideal applicant for the job. I might also add that he

had been employed by the Free Press as a reporter and occasional correspondent. All this added to his value in advertising needs and benefits to be expected from the institution he was about to serve. The Board unanimously appointed him to the position.

It was then that a second hazard had to be met, namely, the selection of a site for the proposed institution, and that was quite as difficult as the securing of the money. The Board found itself besieged by a number of real estate men who had ideal sites at their disposal. Besides this, a great number of individuals wanted the institution located as central a location as possible so as to provide easy access to patients from all parts of the province. The citizens of Winnipeg, on the other hand, wanted the Sanatorium close at hand, and as the citizens of Winnipeg contributed more than all the rest of the province put together, these claims had to be recognized. Then the doctors who were familiar with the locations of sanatoriums in many parts of North America put forward various reasons for its location, alongside of the lake or a running stream or on a gravel ridge or in the evergreen forests or on sandy soil, so that the longer the Board delayed its decision the more difficult it was to decide. It reminded me many times of that old man and his sons who had to take a loaded donkey across a narrow bridge. Eventually, however, the Board became pretty well united on one of four or five sites. To decide on one of them we determined to go and consult an expert on Tuberculosis from Saranac Lake and so Dr. Lawrason Browne, a patient of Dr. Trudeau's, and himself an active practitioner at Saranac Lake, was brought up to Manitoba to look over the ground and make the final decision. Dr. Browne spent a month or more here and visited on all the likely spots, and finally gave his decision that the institution should be built on the Brokenhead River, about thirty miles east of Winnipeg. The Provincial Government came into the picture again and stated positively that its grant was not available unless the Sanatorium was built at Pelican Lake near the village of Ninette. It would have been very much simpler had the government made the statement in the first place. But I think the method adopted had the effect of making every citizen of Manitoba conscious of the fact that we were going to have an institution all our own for the treatment of Tuberculosis.

I have on my farm an old oak tree, probably the largest oak tree in the Red River Valley. Sturdy and strong it stands, and has stood probably for two hundred years buffeting the storm and Arctic temperatures, and in the summer clothing itself in its costume of shining leaves and blossoms which foretell its perennial crop of acorns. Just a few feet away grew another oak almost as large, but from some vicissitude, some insect pest, some hazard of fire or flood it died forty years ago. It perished and in a few short years was converted into the original mould from which

teit sprung, and now even the spot where it grew
tis forgotten. The only difference in the history
bof these two trees is that in the case of the living
tree, that mysterious, vital thing is still present.
tThe thing that weaves its bark, that wraps its
rings of fresh wood around its trunk each year,
that clothes its twigs with leaves, that makes the
eroots hold the stem to the earth beneath, and that
sedifts its ponderous trunk against the wind and
thsun and gravity, the thing that it is, all these are
elthe spirit of the tree. It is quite evident, therefore,
athat the difference between the dead oak which
eahas been converted into ashes and the living sturdy
ioak is that the latter houses the spirit of a tree.
idSo I would like to compare the material things
ovwhich made Dr. Stewart present to our senses,
nthe Dr. Stewart we knew chasing the histories of
e, the old Hudson Bay Forts, the battlegrounds of
a Indian tribes, following the migration of birds,
e seeking for financial assistance for the institutions
or he so well served, writing reams of reports, finding
of fresh trails to be followed, these multiferous
rtactivities were but the outward manifestations of
f the driving force, of the spirit, which ennobled
ghim and made the people of this province forever
shis debtors and the heirs to his intangible, but
thnevertheless, priceless estate.

m
rh A year or so before his death he gave me a
ovbook; he had given me many books before, but I
mhav often thought since, that his last gift had a
especuliar and perhaps conscious application to his
geown life. The book was entitled "The Worst
nJourney in the World." It was a description of
rScott, the explorer of the Antarctic continent, and
his effort to get a specimen of the Emperor Pen-
pouquin's egg to take with him on his return to Great
Britain. The bird itself was well known, but no
teone had ever seen the egg which is laid and incu-
bated in the middle of the Antarctic winter. Its
enincubation takes place in one of the most inacces-
sible parts of the coast line. Scott and some of
urhis company set off in the very darkest and coldest
notime of the year, and the hardships the party
eunderwent are unparalleled in the history of Polar
veexploration. I believe that Dr. Stewart was think-
ing of himself, for he had already undergone sev-
eral years of the most intense suffering, and the
erillness and its accompanying discomforts and final
wtermination could aptly be described as "The
fo Worst Journey in the World," yet he never men-
tioned it as such, when I saw him as I often did,
and inquired by asking him how he felt, he
always replied by saying, "Oh, not so bad, I think
eyI can see a little light ahead, the nights are long,
obbut I often sleep in the morning." I am sure
mhe was tracing and retracing his difficult steps
thn that "Worst Journey in the World." I do not
think there was anything in his whole life that
ndemonstrated his spirit in stronger language than
os the manner in which he accomplished "The Worst
ecJourney in the World." He was heroic, he was
tinvincible. I can think of no better symbol of
arhow he lived and how he died than the statue
iel "Gloria Victis." The statue represents a young

gladiator who has just received his death blow
while facing his foe. As he falls, his broken
sword still in his hand, the figure of Victory, with
great outstretched wings, swoops down and ear-
ries him upward in her arms. A heroic copy of
this statue stands in front of the C.P.R. station
in this city.

Dr. Stewart had the faculty of inspiring all
whom he came in contact with, with a desire to
emulate his industry. I never heard of a student
who, after returning from the course at Ninette
Sanatorium, did not enthusiastically praise the
opportunities he had had of learning the clinical
signs of Tuberculosis, and of the proper methods
of treatment. Those graduates of this school who
spent their interne years at Ninette, to the last
one, speak of Dr. Stewart with reverence.

It is astonishing what some men can accomplish
by eloquence and by effort in getting other people
to carry into fruition a great plan. I can think
of no better example of that driving force than
what happened some twenty-five hundred years
ago when Pericles was the first citizen of Athens.
Athens at that time had a population of 150,000;
half of that number were slaves, the other half
free men. The slaves did all the work and the
free men all the talking and voting. Athens at
the beginning of the reign of Pericles as first
citizen was a sprawling, unkempt city, between
the mountains and the sea. Pericles had a vision
in his mind's eye. He saw the Parthenon shining
in white marble on the hill above the city. He
saw the streets straightened and Athens trans-
formed into a triumph of art which would be "a
Thing of Beauty and Joy Forever." He enlisted
the services of Phidias the sculptor. He got the
money because of a prolonged peace in Greece;
quite a large sum for these times had been accum-
ulated in anticipation of a coming struggle with
Persia. The marble was quarried at some distance
and brought into the harbor at Athens in barges
and across to the acropolis by mules and oxen
and men. The spirit which prevailed the Athenian
population had its counterpart in the Raising Bees
which were so common in the days of the early
settlement in Ontario and Quebec. Every able-
bodied man would voluntarily come to the farm
of a neighbor to put up the barn or house in a
single day and enjoy it. So the 75,000 Athenians
forgot the sweat and blood they were shedding.
They saw instead what was going on, on the hill
behind their beloved city, under the watchful eye
of Phidias and Pericles. It is related that an aged
mule, broken and spavined, had been discharged
from the transport column and put out to pasture
among the derelicts. But the next morning, to
the surprise of all, the wretched hybrid took her
place in the army of burden-bearers which carried
the marble from the dock to the acropolis. Even
the dumb animals had embodied the spirit of
Pericles. So when you went to Ninette the spirit
of Stewart seemed to pervade and guide the lives
of the four hundred laborers that toil in his vine-
yard.

I have often wondered what Dr. Stewart's history would have been had he continued in the ministry. As mentioned before he was at Frank, Alberta, a preacher in 1901, and he returned to college that fall a medical student. Considering his heredity and upbringing, it must have taken a considerable jar to shake him loose from his theological fetters. The shock was provided by the top half of Turtle Mountain sliding down on the town of Frank. When you come to regard the different lines of activity that he followed while superintendent of the Sanatorium, namely, historian, scientist, physician, philosopher, horticulturist, teacher and writer, it is difficult to understand how such a mentality, such an embodiment of vigor, such a paragon of sympathy and industry, could have confined himself to the inelastic boundaries of the theological career.

His manner of work fascinated me. I often stayed at his residence when visiting Ninette and we usually spent the time between dinner and bedtime in talk, he contributing extended answers to all questions. Then about ten or eleven o'clock my day was far spent and I retired. Usually I woke up long after midnight to see the doctor still at work, and to hear the scratch of his nimble pen and the rustle of manuscript. I think that two or three o'clock in the morning was his usual hour for retiring. I must say, however, that he did not rise early, seldom appearing before nine or ten o'clock in the morning. Many times I have flung the old quotation at him, "Early to bed and early to rise makes a man healthy, wealthy, and wise," and he would reply, "I'll never be healthy, nor wealthy that's a certainty; knowledge comes while wisdom lingers, and if I live to be eighty, and keep on reading and writing I may be half as wise as I'd like to be." I could never agree with Dr. Stewart when he said that he could never be wealthy, for he was wealthy, in the truest sense. A great philosopher once said "The man is the richest whose pleasures are the cheapest." When he looked across the valley from his hill top at eve and when he saw the long lines of water-fowl, their shadows cast against the crimson sky, the peace that passeth all understanding came down upon him with the shadows of night. These were his pleasures—pearls richer than all his tribe.

Most of his writing took the form of reports on various aspects of his work as Superintendent of the Institution. The contents of these reports consisted mostly of comments on routine matters, and he was so conscientious and covered the ground so thoroughly that many of us thought he made a slave of himself to an unnecessary degree. He must have written volumes in describing the day by day happenings at the Sanatorium, with the travelling clinics and at medical conventions and so forth.

For over twenty-five years Dr. Stewart was Superintendent of the Ninette Sanatorium, the duties of which appointment were arduous and

exacting, and he spared neither time nor effort in promoting the interests and efficiency of this institution. In fact, that was a whole time job, and nevertheless, it was only one of the numerous avenues of his activities and perhaps not the chief. I had little idea of the amount of work he had done of a literary character. In addition to the drudgery of the daily reports referred to, his purely literary and scientific manuscripts are voluminous. For instance, on Clinical Medicine and on General Disease he wrote three papers, on Clinical Tuberculosis thirty papers, Scientific papers on Tuberculosis one, on History, Biography, Philosophy and Travel, seventy-two papers; on Medicine Education, Medical Societies and the Medical Profession, sixty-nine papers, and Public Welfare activities, seventy-two papers; miscellaneous addresses and letters, five manuscripts; in all, two hundred and fifty-two papers of varying length, some of them fair sized pamphlets. The collection of these papers and manuscripts in the possession of his son, David Stewart, makes five very large volumes, and how one man could have composed and written in long hand as he did, such a vast amount of carefully prepared and accurate information on so many different subjects, gives one a new slant on the capacity that some men have for work. Thoreau said, "He was rich because of all things on earth he loved to work, and the more one works the better he works and the more he wants to work." If that is the way to be happy, Stewart must have been supremely blest. To try to estimate the value of his literary achievement and to record it in an address of this kind is quite beyond my capacity.

I may only say that from the date of his sojourn in Frank, Alberta, to the last moment at which he could hold a pencil, he was driven by the demands of industry. His sketch of Frank, illustrated by snapshots of the town and devastated area, is well worth perusal. Of his purely literary efforts, his essay on Dickens seems to me the most worthwhile. For its compilation he must have read exhaustively, among others, Chesterton and Carlyle. The creation of the Dickens paper could never have been accomplished without weeks and months of study on the subject. He gave me a new slant on Dickens speaking of him first of all as a reformer, laying out as he wrote with a purpose and not to entertain; perhaps he was right, but Dickens appears to me to have been a strong story-teller and he rejoiced in his strength rather than in the moral behind the tale.

Dr. Stewart was a very great admirer of Robert Louis Stevenson and spoke of him frequently in his addresses and in ordinary conversation. Stevenson, as you know, spent almost a year at Saranac Lake and Trudeau speaks of Stevenson as the most distinguished individual he ever knew as a patient. He tells that Stevenson gave him a complete set of his books with special binding and with a dedication in his own hand-writing on the front page of each volume. In all probability Dr. Stewart learned to know of Stevenson the moment while he was at Saranac Lake in 1910.

Dr. Stewart accomplished so much in so many different fields of effort, largely because he had the happy faculty of being able to enlist the advice and help of, I might say, everyone with whom he came in contact. To illustrate—when you stand on the top of the hill at the Sanatorium you see the enormous valley stretching for miles north and south, a valley large enough to hold the Mississippi River, but containing a few ponds joined by a trickling stream which is often completely dry and which terminates in Pelican Lake, which has no natural outlet. What you see suggests the possibility of an interesting geological history. Dr. Stewart had Professor Wallace spend a week with him to read the marvellous story of which the scenery of Lang's Valley records.

Dr. Stewart wanted a garden. Presto! Mr. Leslie of the Experimental Farm drove up and soon flowers and fruit trees and shrubbery appeared where there had been only tangled woods before. No matter where one turned at Ninette Sanatorium you were met by the evidence of expert advice in the solution of all the problems which had arisen.

I assume that the reason for establishing this annual Stewart Memorial Address is that you medical students may learn something of his life and emulate him in his career as a physician and a citizen of the world. Kipling said, "If you will let me, I will wish you in your future what all men desire. Enough work to do, and strength enough to do your work." It is incumbent on me, therefore, to pass on to you the impressions that Dr. Stewart made on me during over thirty years of intimate friendship. I would say without hesitation that the one thing in his life that stands out with crystal clearness in this summary was his industry and most unusual capacity of attention to details. When I think of all he did it might be said that he had a fabulous instinct for toil, when by day and night, at home or abroad, or in his crowd, he was at work. How did he do it? A contemporary American editor who resembled Dr. Stewart in his way of living replied when a friend asked him why he worked so hard, "I keep on working hard for the same reason that a hen keeps on laying eggs." What a hen's reason for laying two or three hundred eggs a year is a problem that may be solved by reading Julian Huxley's essay on "Bird Mind," and I am equally sure that I could give no satisfactory reason for Dr. Stewart working as he did sixteen to eighteen hours out of the twenty-four. I am not prepared to advise you to follow his example in that respect. Such a career is a marvel and something to be wondered at and admired, but the average man or woman I believe should follow the advice of King Alfred who said "Eight hours for work, eight hours for sleep, and eight hours for play." You must all remember Longfellow's verse,

"The heights by great men reached and kept
Were not attained by sudden flight,
But they, while their companions slept,
Were toiling upward in the night."

If one chooses to study at night and play in the daytime he may still achieve the heights that great men have reached and kept, but let him remember to play. It isn't the amount of work that one does that makes him famous, or benefits the race, but it is the quality of his product that counts. In rare individuals there is a capacity for producing both quality and quantity of supreme value. Dr. Stewart approached such an unusual type of man, but there has been only one Dr. Stewart among the thousands or more graduates of this college.

Dr. Stewart did a great number of jobs and did them well, but the thing above all others that will make his name long remembered was what he accomplished in the treatment of Tuberculosis. In 1910 when the Ninette Sanatorium was opened under his care the death rate among white people in Manitoba was 94 per 100,000. In 1938 the death rate among the white population had fallen to 36 per 100,000, a record of which any man or any community might boast. He did it by keeping everlastingly at it. He did as Theodore Roosevelt would have done it when he said to himself, "I am only an average man, but by George I work harder at it than the average man." The thing that he had done was well worthwhile, perhaps the best work worthwhile of all the things he might have done in that thirty years. He saved thousands of lives, he restored fathers and mothers to their families, he sent children back to their homes strong and well and educated both in health matters and with the common school education given to them at Ninette without cost. For these great benefactions reflected in the life and happiness of this province we are indebted to him. We lament his loss cut off in the prime of his usefulness. Our regrets are best expressed in that immortal verse from Cymbeline:

"Fear no more the heat o' the sun,
Nor the furious winter's rages;
Thou thy worldly task hast done,
Home art gone, and ta'en thy wages.
Golden boy and girl all must,
Like chimney-sweepers, turn to dust."

NOTICE

The Authorship Committee appointed by the Department of Cancer Control of the Canadian Medical Association has undertaken as its initial effort the production of a handbook on cancer for the Medical Profession.

The manuscripts for this handbook were submitted for criticism, through the Deans of the nine Medical Schools in Canada, to the leaders in our profession interested in cancer, as well as to the Cancer Committee of each of the nine Provinces. The final text is an attempt to express the combined opinion of these collaborators.

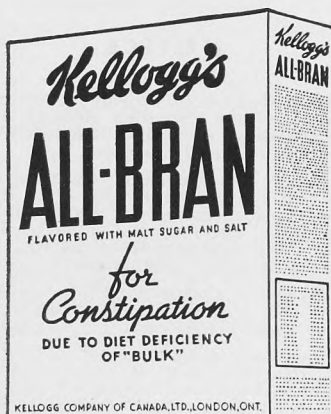
Cancer of the various anatomical sites is discussed from the standpoint of pathology, diagnosis, treatment and prognosis. The book will be off the press this summer.

If you feel that such a book would be of value to you in your work, the Canadian Medical Association will be glad to mail you a copy with its compliments, if you will write your request (using your professional stationery) to the Department of Cancer Control of the Canadian Medical Association, 184 College Street, Toronto.

T. C. ROUTLEY, General Secretary,
Canadian Medical Association.

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OBITUARIES

DR. GEORGE DARLING SHORTREED

Dr. George Darling Shortreed died sudden March 13 at the Grandview Hospital, Grandview, Manitoba. He was born at Walton, Ontario, studied at Seaforth, Kenton and Toronto, and taught school at Melita and Brandon, Manitoba, in the early nineties. He graduated from Manitoba Medical College in 1901, practiced a year in Melita and then went to Grandview where he remained till his death.

In northwestern Manitoba he was a leader in community enterprises. In 1927 he built the Grandview Hospital which he owned and operated for twelve years. He was mayor of the town from 1927 to 1932, president of the local Board of Trade from 1929 to 1932, and president of the Dauphin Liberal Association. In 1919 he was president of the Manitoba Medical Association. He was an able and successful practitioner and was noted for his fearlessness and independence.

DR. MAXWELL WALLACE

Dr. Maxwell Wallace, 70, died February 28 at Hallock Hospital, Minnesota. Born in Scotland he came to Canada in 1886 with his father, who farmed at Niverville. In 1903 he graduated in medicine from Manitoba Medical College; practised for six months at Dominion City, and then took over the practice of Dr. S. Elkin at Emerson, where he continued to practise until his death. For ten years he was Chairman of the Emerson School Board, and also President of the Curling Club. He was buried at Emerson. He is survived by his wife, three daughters and one son.

Travelling Clinic Programme Sanatorium Board of Manitoba

Virden—Tuesday p.m., April 9; Wednesday a.m., April 10.
 Dauphin—Thursday, April 11.
 Brandon General Clinic—Friday, April 12; Saturday a.m., April 13.
 Two-week interval Sunday, April 14 to Monday, April 29.
 Selkirk—Tuesday 10 a.m., April 30; Wednesday 1; Thursday a.m., May 2.
 Beausejour—Friday, May 3; Saturday a.m., May 4.
 Gladstone—Tuesday p.m., May 7; Wednesday a.m., May 8.
 Dauphin—Thursday, May 9.
 Brandon—Friday, May 10.
 One-week interval Saturday, May 11 to Sunday, May 19.
 Lowe Farm—Monday p.m., May 20; Tuesday a.m., May 21.
 Morden—Wednesday, May 22; Thursday, May 23.
 The day of the chest clinic at the Dauphin General Hospital has been changed to the 2nd Thursday of each month.
 The day of the chest clinic at the Brandon General Hospital has been changed to the 2nd Friday of each month. (The Friday following the second Thursday)

Department of Health and Public Welfare

NEWS ITEMS

"THE CONTROL OF RESPIRATORY INFECTIONS"—By Dr. Russell L. Cecil, Professor of Clinical Medicine, Cornell University Medical College, New York City.

(Continued from March, 1940,
"Manitoba Medical Review")

Acute Tonsillitis and Quinsy

"Acute tonsillitis is almost always a streptococcus hemolyticus infection. In some cases the fusospirochetes act as secondary invaders, and produce so-called Vincent's Angina. Acute tonsillitis is fairly contagious, and epidemics are not uncommon in pediatric wards and institutions for young children. The child who is subject to repeated attacks of acute tonsillitis presents quite a problem to the pediatrician. Though not often serious in itself, it may lead to very unpleasant complications or sequelae. Among the most common are otitis media, and mastoid infection. Para-tonsillitis, or quinsy is another. Infection may extend upward into the sinuses or downward into the trachea with the production of streptococcus pneumonia. In the temperate zone, acute tonsillitis is often followed by rheumatic fever. For these reasons the prevention of repeated attacks of acute tonsillitis is imperative.

"The simplest preventive measure is tonsillectomy. If the operation is performed by a skillful operator, regrowth of the tonsillar tissue will recur in a very small percentage of cases.

Septic Sore Throat

"Septic sore throat is a severe acute infection of the pharynx, caused by the *Streptococcus hemolyticus*. Like tonsillitis, it frequently occurs in epidemic form. The most striking epidemics have been due to milk-borne infections in which the milk supply has been contaminated from human sources.

"The prevention of septic sore throat implies the most careful handling of milk, particularly in the process of milking the cow. The cow's udder should be carefully cleansed before milking, and rigid asepsis should be practiced by milk handlers. Individuals who are suffering from acute respiratory infections should not be allowed to come in contact with the cows or with the milk.

Diphtheria

"The prevention of diphtheria is a long story, and one which can be touched upon only briefly in the present article. Systemic symptoms in diphtheria are caused by the absorption of a toxin which is manufactured in the diphtheritic membrane by the diphtheria bacillus.

"Formerly attempts to control diphtheria by rigid isolation and quarantine of the patient were not successful in preventing a very high death rate from the disease. At the present time control of diphtheria is much more effectively obtained by active immunization. In 1913 von Behring¹⁴ utilized for the first time injections of toxin anti-toxin mixtures in children for active immunization against diphtheria. Von Behring's methods were taken up in America by Dr. William H. Park,¹⁵ who in 1917 inaugurated wide-spread immunization with toxin anti-toxin in New York City. This procedure has reduced the morbidity and mortality of diphtheria to extremely low levels. At the present time 'toxoid' is rapidly replacing the toxin anti-toxin mixtures. Toxoid has the important advantage of not sensitizing the child to horse serum. The toxoid is given in three doses of 0.5 c.c., 1.0 c.c. and 1.0 c.c. subcutaneously at intervals of three to four weeks.

Six months after immunization a Schick test is done to determine whether or not immunity has developed. Active immunization against diphtheria is most effective when applied during the latter part of the first year of life, but it may be used with good results at the school age or in adults who have been brought into contact with the disease. The immunity obtained by active immunization lasts for many years, and probably for life in most cases.

"Reactions to the toxoid are infrequent, though slight malaise and fever on the day following injection may occur, especially in older children.

"The Schick test is performed by intradermal injection of 0.1 c.c. toxoid solution containing 1/50 of a minimal lethal dose of toxin. The injection should produce a distinct wheal in the skin. The positive reaction to the toxin appears in 24 to 48 hours, increases from four to five days, and increases in size from 1 to 7 centimeters in diameter. Severe reactions may be vesiculated. A positive reaction to the toxin shows lack of immunity.

"The prevention of the spread of diphtheria requires the following precautions:

1. All patients as well as carriers should be properly isolated.
2. All linen, dishes, and other utensils should be sterilized and taken from the isolation zone. The clothes of attendants should be protected by gowns. Sterilization should be done by boiling, dry heat, or chemical disinfection with 1 per cent. tri-cresol solution.
3. The patient must be kept in quarantine until at least three consecutive throat cultures have been negative for diphtheria bacilli.

Complications of Upper Respiratory Infections

(a) "**Acute Otitis Media.**—Many young children, particularly of the adenoid type, are subject to repeated attacks of otitis media. These attacks usually follow an acute coryza or pharyngitis. The micro-organism concerned is usually a *Streptococcus hemolyticus* or some type of pneumococcus. One of the most satisfactory methods of preventing these recurring attacks of otitis media is surgical removal of the tonsils and adenoids. Following such an operation, many of these children never have a recurrence of middle ear infection.

"**Mastoiditis.**—Mastoiditis follows otitis media. Hence, the prevention of mastoiditis pre-supposes the prevention of otitis media. The same micro-organisms are concerned, but a large part of the middle-ear infections which progress into mastoiditis are referable to either pneumococcus Type III or *Streptococcus hemolyticus*. If these infections are not handled properly there is danger of extension of the infection into the lateral sinus and consequent thrombo-phlebitis. In other cases a localized brain abscess or meningitis may ensue. It is therefore of the utmost importance that these infections of the middle ear should be carefully watched, and if untoward symptoms develop an otologist should be called into consultation.

"(b) **Acute Sinusitis.**—Acute sinusitis is one of the commonest complications of influenza and the common cold. Almost any of the common pathogens may be responsible. Some of the more persistent of these infections are caused by the Pfeiffer bacillus. Those which are characterized by high fever and cellulitis of the face are usually referable to the *Streptococcus hemolyticus*. The most prevalent infectious agent is some type of pneumococcus.

"The prevention of acute sinusitis would be a simple enough problem if the common cold could be eliminated.

In certain cases mechanical obstruction in the nose, such as deviation of the septum or polypoid growths, strongly predispose to sinus infection. If such anomalies are corrected, the patient may then be able to throw off an acute coryza without developing sinus complications. From the writer's personal experience it has always seemed that cold vaccines, even if they fail to prevent colds, at least greatly reduce the incidence of sinus complications.

"(c) **Pneumonia.**—Pneumonia is one of the commonest and most serious complications of acute upper respiratory infections. Primary pneumonia without a preceding infection of the nose and throat is quite unusual. When it does occur as a primary infection, it usually is seen in an acute alcoholic or in an individual who has been grossly exposed to cold and wet (submersion). Primary pneumonia may also occur in the very aged or in those who have been greatly weakened by some chronic systemic disease. Ordinarily, lobar and broncho-pneumonia are secondary infections. Pneumonia is particularly prevalent during influenza epidemics when it often presents itself in a highly virulent form. Pneumonia ranks third as a cause of death in the United States, and for this reason is now looked upon as one of the most important sanitary problems of the day. The great majority of lobar pneumonias (95%) are caused by some type of pneumococcus. The majority of broncho-pneumonias (approximately 75%) are also referable to some type of pneumococcus. In the pneumonia of infancy *Streptococcus hemolyticus* is not an uncommon exciting agent. Both in infants and adults the streptococcus produces a severe and highly fatal form of pneumonia. Fortunately it is comparatively rare in ordinary times. During epidemics of influenza, however, streptococcus pneumonia increases in prevalence. From what has been said above, it is clear that pneumonia is for the most part a pneumococcal infection. At the present time we recognize thirty-two types of pneumonia, the most prevalent of which are Types I, II, III, V, VII and VIII.

"Pneumonia does not lend itself readily to control by ordinary hygienic or sanitary measures. The high incidence of pneumonia in cities is evidence that the pneumococcus thrives best when people live under crowded conditions. Infection appears to be transmitted by direct or indirect contact, in many instances by the droplet method. With the present tendency toward urbanization of our population there seems to be less and less hope of controlling pneumonia and other respiratory diseases by any of the hygienic measures now in vogue.

"The simplest way to prevent pneumonia would be to prevent the common cold or influenza, the two infections which so frequently precede it. We have seen above however that there is as yet no entirely satisfactory method of preventing either disease. Consequently, until such a solution is forthcoming, the only hope of preventing pneumonia lies in the adoption of some method of artificial immunization against the pneumococcus.

"When an animal or man survives an attack of pneumococcus pneumonia, a high degree of immunity against the homologous type of pneumococcus is readily demonstrable. The crisis itself is a striking expression of this immunity. Furthermore, Dochez¹⁶ has shown that the serum of patients convalescing from pneumonia contains protective substances against the homologous type of pneumococcus, and Blake¹⁷ has demonstrated precipitins in the serum of cases of pneumonia that terminate favorably. In addition to these clinical studies, accurate information on the subject of immunity following pneumonia has been obtained from experimental work on animals. In some studies on experimental pneumonia conducted by Cecil and Blake¹⁸ in 1920, these authors showed that in monkeys an attack of pneumococcus Type I pneumonia protects the animal completely against a second infection of

the same type. An attack of pneumococcus Type II pneumonia gave little if any protection against pneumococcus Type II pneumonia. On the other hand, there appeared to be some cross-protection against pneumococcus Type III.

"During the last few years we have had opportunity to follow a number of patients through several attacks of pneumonia and in every instance recurring attacks have differed in type from the initial type. The exception appears to be in the case of pneumococcus Type III infections. There are records of several patients who have had repeated attacks of pneumococcus Type III pneumonia. These attacks, however, rarely come oftener than once a year.

"Prior to 1911 no serious attempt had been made to vaccinate human beings against lobar pneumonia by means of pneumococcus vaccine. In 1911, however, the mortality from lobar pneumonia among tropical natives in the South African Gold Mines became so high that the gold mining industry requested Sir Almroth Wright to investigate the disease with a view to devising some methods of diminishing the death rate.

"Wright²¹ inoculated several thousand miners with pneumococcus vaccine, setting aside control groups of natives for comparison. The incidence of pneumonia among the vaccinated men six months to a year after inoculation was recorded and a similar record kept among the unvaccinated natives. The results were at all convincing. It is easy to see now why Wright failed. At the time of his work the various types of pneumococcus had not yet been differentiated.

"In 1913 Dochez and Gillespie²² published their classification of pneumococci and Lister²³ independently reported shortly afterwards a similar classification of the pneumococci in South Africa. Lister then undertook an experimental study of prophylactic inoculation against the various types of pneumococcus in animals and man. He demonstrated that immunity could be produced in man against at least certain of these types either by subcutaneous or intravenous injection, more readily by the latter.

"Lister's results with pneumococcus vaccine were much more satisfactory than those obtained by Wright. The three prevalent types of pneumococcus were contained in the vaccine and the dosage employed was quite high.

"In the winter of 1917-1918 the author, in collaboration with J. H. Austin²⁵ of the Rockefeller Institute, undertook an extensive field experiment in the vaccination of recruits at Camp Upton, N.Y. The vaccine employed contained equal parts of pneumococcus Types I, II and III. Altogether 12,519 men—about 40% of the mean strength of the command—were vaccinated. The majority received three or four inoculations; some only one or two. No cases of pneumonia due to these three fixed types occurred among those receiving one or more injections of vaccine during the subsequent ten weeks. In the control group of approximately 20,000 unvaccinated men there were 26 cases of pneumococcus Types I, II and III pneumonia. There were 9 Type IV pneumonias and 7 streptococcus pneumonias among the vaccinated troops whereas among the unvaccinated men there were 44 Type IV pneumonias and 106 streptococcus pneumonias. The case mortality rate among the vaccinated was only 11.7% whereas that for the unvaccinated was 28%. Cecil Vaughan²⁶ conducted a second field experiment at Camp Wheeler, Georgia, the results of which were somewhat confused by the influenza epidemic.

"More recently Felton²⁷ has been vaccinating large numbers of CCC men with a pneumococcus antigen which gives protection against most of the prevalent types of pneumonia. Felton's results have recently been reported, and are very promising. The reaction to Felton's pneumococcus antigen is slight, and the immunity established appears to be adequate.

Typophylactic purposes, pneumococcus vaccine as it is prepared by the commercial houses consists of an equal quantity of pneumococcus Types I, II and III, of such strength that 1.0 c.c. contains 9 billion pneumococci. Three injections are given at five to seven day intervals, the first dose 3 billion, the second 6 billion, and the third 9 billion. Three injections of this dosage should give an individual fairly good protection against the three prevalent types of pneumococcus for four to six months or even longer. The injections are given intramuscularly just as typhoid fever any other vaccine is administered.

"It should be noted in passing that the ordinary stock cold vaccines are composed largely of killed pneumococci. For this reason the physician, when he vaccinates his patient against the common cold, simultaneously confers upon him a certain amount of protection against the commoner types of pneumonia. We have pointed out above that in some of the group studies with cold vaccines the absence of pneumonia among the vaccinated group was quite striking.

"Pneumococcus vaccine is indicated for individuals who are very susceptible to pneumonia and who suffer from repeated attacks of the disease. In such patients, however, it is well to make careful throat cultures with the idea of determining if the individual is a carrier of virulent pneumococci. If so, an autogenous monovalent vaccine may be preferable to a stock polyvalent vaccine.

"Pneumococcus vaccine will also prove valuable in these immunization of recruits in time of war. In the World War pneumonia was the most serious of all infections and caused the greatest loss of life. The vaccine is often indicated in the case of green recruits who are suddenly mustered into training camps where they are subject to contact with pneumococcus carriers, exposure to inclement weather and the lowering of resistance which comes with fatigue and over-exertion. Pneumococcus vaccine could probably be used with benefit in the case of industrial workers, such as day laborers, truck drivers, chauffeurs, firemen, and policemen, who are constantly exposed to wet and cold. The practical difficulty which one encounters here is the wrong objection which these people have to taking the vaccine on account of the reactions.

"The advisability of vaccinating nurses, physicians and relatives who come in contact with a patient with pneumonia is a question which has not received much attention. The writer has seen a number of cases of contact infection in the same family. Pneumonia is not looked upon as a contagious disease, but occasionally it becomes so. Once we obtain a potent vaccine which excites little or no reaction it might be worth while to vaccinate everyone who comes in contact with a pneumococcal infection.

B—CHRONIC RESPIRATORY INFECTIONS

"Most chronic respiratory infections are the sequel of a preceding acute respiratory infection. In many cases the chronic disease results from repeated attacks of the acute infection. Chronic infections of the respiratory tract present many grave therapeutic problems. The prevention of chronic respiratory infection, on the other hand, opens up many interesting possibilities, both to the physician and to the public health officer. It is quite obvious from a study of these conditions that many of them could be prevented if proper precautions were taken by the patient and the physician.

"We will now proceed to a discussion of some of the more common chronic respiratory infections.

Chronic Pharyngitis

"Chronic pharyngitis may exist in either the hypertrophic or atrophic form. In many cases the chronic inflammation of the pharynx is secondary to infected tonsils or sinuses. Prompt removal of these foci of

infection will often prevent or even cure chronic pharyngitis.

Chronic Sinusitis

"Chronic infection of the sinuses usually results from neglected acute sinus infection or from improper ventilation and drainage. Acute sinusitis, either in children or adults, may be treated conservatively for a week or so, but after this if the discharge and headache continue, a specialist should be consulted and irrigation by douches or suction should be instituted. If these fail it may be necessary to introduce a trochar into the sinus and drain out the pus. When the natural opening is too small to permit of free drainage, it may be advisable to enlarge the opening by surgical operation. Chronic sinus develops in some patients as a secondary manifestation of chronic disease infection of the tonsils and adenoids. In such cases removal of the infected tissue is indicated. In other cases obstruction in the nasal cavity by polyps or by a deviated septum prevents proper ventilation and drainage, and leads to chronic infection. In such cases surgical intervention will often yield excellent results.

Chronic Tonsillitis

"It is important to make a distinction between hypertrophied tonsils and tonsillitis. Some degree of hypertrophy of the lymphoid tissue of the pharynx is a physiological process in children and even in young adults. Chronic tonsillitis usually results from repeated attacks of acute tonsillitis. In such cases the tonsils remain enlarged, congested, and edematous, and are sometimes the site of small abscesses.

"The relation of chronic tonsillitis to systemic disease presents one of the most baffling problems of medicine. Tonsils can be chronically infected and still produce no symptoms elsewhere in the body. On the other hand, apparently innocent looking tonsils may harbor concealed abscesses and produce various constitutional disturbances such as rheumatism, arthritis, iritis, etc. In children or young adults who give a history of repeated attacks of acute tonsillitis, the advisability of tonsillectomy should be seriously considered and in most cases the operation is indicated.

Chronic Bronchitis

"Chronic bronchitis is rarely a primary affection, but results from repeated attacks of acute bronchitis. It may be secondary to chronic sinus disease, particularly when the antra are involved. It is often associated with bronchiectasis, chronic interstitial pneumonia, tuberculosis, or pneumoconiosis. Not infrequently it follows the pulmonary congestion which results from heart disease or emphysema.

"The prevention of chronic bronchitis will depend in great measure on the success with which one prevents the preceding cause. A mild form of chronic bronchitis is often referable to excessive smoking, and this of course can be obviated by discontinuance of tobacco. Another common form is the 'winter cough' of old people. The answer here is migration to a warm climate during the winter months.

Lung Abscess

"A great deal has been written in recent years about the treatment of lung abscess, but very little has been said about its prevention. Emerson²⁸ describes three varieties of lung abscess:

1. Pyogenic, usually metastatic from foci elsewhere.
2. Fusio-spirochetal, associated with mouth organisms of the spirochetal group.
3. Mycotic abscess due to yeasts and molds.

"The first group may be secondary to a carbuncle, but metastatic abscess in the lung may result from infected infarcts following a surgical operation. The fusio-spirochetal abscess is by far the commonest type. This frequently follows some operation around the

nose or throat such as removal of a turbinate, tonsillectomy, or extraction of a tooth. Mycotic abscesses are so rare that they need not be discussed in the present paper.

"Since the great majority of lung abscesses are associated with fuso-spirochetes and fall into the group of so-called putrid abscesses, it would seem that elimination of fuso-spirochetes from the buccal cavity would be one method of preventing the disease. This can be done by various mouth washes such as sodium perborate or neo-salvarsan, but best of all by keeping the teeth and gums in the very best possible condition. Pyorrhea practically always means many fuso-spirochetes. It has long seemed to the writer that oral surgeons and rhinologists are much too indifferent to the condition of the mouth at the time of operations in this cavity. Tonsillectomy in a dirty mouth, especially when done under general anesthesia, invites insufflation of contaminated saliva into the trachea and provides a perfect setting for the development of lung abscess. A nasal or oral operation should always be preceded by thorough cleansing of the buccal cavity with mouth washes or better still with dilute iodine and alcohol swabs. It is the writer's belief that most putrid abscesses are bronchogenic in origin, though Cutler²⁰ and his school have stressed the importance of hematogenous origin in abscesses which come on after abdominal operations.

"A certain number of abscesses follow pneumonia or other upper respiratory infections. This however constitutes only a small percentage of the total number of abscesses. Even in this group the theory is tenable that the incidence of abscesses would be less in patients with clean mouths than in those with dirty mouths.

Bronchiectasis

"Bronchiectasis is a chronic disease of the bronchi and bronchioles, characterized by dilatation of the tubes and inflammatory reactions in their walls. Two factors operate to produce the dilatation, first, damage of the bronchial wall, and second, increased tension in the bronchiole, as in the act of coughing. The most frequent cause of the damage to the bronchial wall is infection in the form of bronchitis. Long-standing sinus disease, especially maxillary sinusitis, often precedes and is responsible for the bronchial infection. Many cases of bronchiectasis date from the infectious diseases of childhood, especially whooping cough and measles. Influenza is an important etiologic factor by reason of the fact that it is characterized by widespread peri-bronchial inflammation.

"The prevention of bronchiectasis is obviously dependent in great measure on the prevention of the preceding infection. Prophylaxis of upper respiratory infections has already been discussed.

Pulmonary Tuberculosis

"The prevention of pulmonary tuberculosis is too large a subject to be covered in this article. The prevention of tuberculosis involves isolation of patients, sterilization of sputum, pasteurization of milk from tuberculous cattle, and the removal of children from contact with tuberculous parents. The method of immunizing young children with the Bacillus Calmette Guérin (B. C. G.) was first tried out in France, and is now being tested extensively in the United States. In America the death rate for tuberculosis has fallen so rapidly that some statisticians such as Dublin believe that tuberculosis may become a rarity within the next fifteen or twenty years. In that case prophylactic vaccination will not be necessary.

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COMMUNICABLE DISEASES REPORTED

Urban and Rural - January 29th to February 25th, 1940

Measles: Total 1,270—Winnipeg 1,009, Flin Flon 125, Tuxedo 37, Fort Garry 19, Hanover 7, St. James 6, Kildonan East 5, North Norfolk 5, Unorganized 5, Bifrost 4, St. Boniface 2, Neepawa 2, Kildonan Old 1, Louise 1, Portage City 1, St. Clements 1, St. Vital 1, Springfield 1, The Pas 1 (Late Reported: Grey 28, Tuxedo 6, Flin Flon 2, Hanover 1).

Chickenpox: Total 184—Winnipeg 55, Brandon 26, St. Boniface 22, Blanshard 8, Montcalm 8, Siglunes 7, Kildonan East 8, Portage Rural 5, Hamiota Rural 4, Kildonan West 3, St. James 3, Springfield 2, Tuxedo 2, Unorganized 2, Flin Flon 1, Hamiota Village 1, Rapid City 1, St. Clements 1, St. Paul West 1, The Pas 1 (Late Reported: St. Boniface 8, Brandon 8, Harrison 2, Daly 1, Hamiota Rural 1, Rhineland 1, Stonewall 1, Unorganized 1).

Whooping Cough: Total 124—Winnipeg 60, St. Boniface 20, Brandon 4, Brooklands 2, Kildonan East 2, Morton 2, Transcona 2, Cameron 1, Flin Flon 1, Portage City 1, St. Clements 1, St. James 1, St. Vital 1, Unorganized 1 (Late Reported: St. Boniface 6, Brooklands 4, Unorganized 4, Morton 3, Brandon 3, Portage City 2, Rhineland 2, Ste. Rose Rural 1).

Scarlet Fever: Total 88—Winnipeg 20, Cartier 9, Tache 7, Morton 6, Thompson 5, Springfield 3, Ethelbert 2, Hamiota Rural 2, Kildonan East 2, Minnedosa 2, Minitonas 2, Rosedale 2, St. Boniface 2, Strathclair 2, Daly 1, Gilbert Plains Rural 1, St. Paul West 1, St. Vital 1, Swan River Rural 1, Tuxedo 1, Unorganized 1, Woodlea 1 (Late Reported: Tache 11, Minitonas 1, Rosedale 1, Tuxedo 1).

Diphtheria: Total 65—Tuxedo 12, Rhineland 4, Kildonan West 1, Portage City 1, Rosser 1, Roblin Town

1, St. Andrews 1, Tache 1, Winnipeg 38 (Late Reported: St. Clements 4, Selkirk 1).

Mumps: Total 64—Winnipeg 56, Kildonan West 4, Kildonan East 1, Portage City 1, St. James 1, Tuxedo 1.

Influenza: Total 44—Brandon 32, Rapid City 3, St. Andrews 2, Saskatchewan 2, Rockwood 1 (Late Reported: Argyle 1, Rhineland 1, Turtle Mountain 1, Unorganized 1).

Diphtheria Carriers: Total 41—Winnipeg 34, Tuxedo 6, St. Clements 1.

Tuberculosis: Total 18—Winnipeg 14, Portage City 2, Montcalm 1, Rosedale 1.

Lobar Pneumonia: Total 13—Brandon 3, Ste. Rose Village 1, Westbourne 1 (Late Reported: Brandon 2, Glenella 1, Macdonald 1, Pembina 1, Ritchot 1, Unorganized 1, Hanover 1).

Septic Sore Throat: Total 9—Westbourne 7, Brooklands 2.

Erysipelas: Total 9—Winnipeg 4, Brandon 1, Macdonald 1, Roblin Rural 1, St. Boniface 1, Winnipeg Beach 1.

Typhoid Fever: Total 4—Unorganized 1, Winnipeg 2 (Late Reported: Roblin Rural 1).

German Measles: Total 1—Hamiota Rural 1.

Undulant Fever: Total 1—Winnipeg 1.

Encephalitis: Total 1—Brandon 1.

Trachoma: Total 1—Hanover 1.

Venereal Disease: Total 110—Gonorrhoea 72, Syphilis 38 (for month of February, 1940).

DEATHS FROM ALL CAUSES IN MANITOBA

For the Month of January, 1940

URBAN—Cancer 46, Pneumonia Lobar 9, Pneumonia (other forms) 9, Tuberculosis 7, Influenza 4, Syphilis 2, Whooping Cough 1, Measles 1, Lethargic Encephalitis 1, all others under one year 12, all other causes 179, Stillbirths 11. Total 283.

RURAL—Cancer 31, Tuberculosis 26, Pneumonia (other forms) 17, Pneumonia Lobar 7, Influenza 5, Diphtheria 1, Syphilis 1, Whooping Cough 1, Dysentery 1, all others under one year 24, all other causes 125, Stillbirths 15. Total 254.

INDIANS—Tuberculosis 6, Influenza 4, Pneumonia (other forms) 3, Whooping Cough 2, Pneumonia Lobar 1, all others under one year 5, all other causes 4. Total 25.

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